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[Translator's proposed title:]
Stressable textile carpet.

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References cited in opposition:

-- EP-A-0349089, EP-A-0500469, CH-A-628228, DE-A-2453675,
US-A-3834978, US-A-4242394.

-- Addedo, A., et al., 1991, [(in German)] "Multilayer polypropylene carpeting for automotive floors", Chemiefasern / Textilindustria Man-Made Fiber, 41, 10 (Oct): 1235-1236, XP000233496 [sic].

Footer: [(Instructions for filing oppositions during the 9-month opposition period, etc.etc.)]

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Specification:

The invention relates to a stressable textile carpet material (floor covering), comprised of:
-- a base fabric and a pile which pile is bound to the base fabric and which covers the base fabric on the treading surface, wherewith they [(the base fabric and pile)] are comprised of polymeric fibers and are [together] manufactured in a tufting process; and
-- a backing layer (6, 7) which is bound to the side (face) of the base fabric which side is opposite to the pile (viz. is bound to the rear side of the base fabric) and which provides walking comfort (and determines the walking comfort).

Textile carpets of the type described hereinabove are generally designated commercially as "tufted carpets", and are marketed as traditional carpets and runners or as so-called carpet tiles. In "tufted carpets", the textile fibers [for the tufting], usually a polyamide, are inserted in the finished base fabric according to the tufting method (needle pile-forming technique). With this arrangement, the base fabric provides dimensional stability, and the pile provides the appearance as well as some of the walking comfort (see, e.g., Kirchenberger, H., [(in German)] "Tufting techniques", Melliand Textilberichte, publisher [(also the name of a journal)], Heidelberg, 1975).

The above-described backing fabric bearing a pile is covered on its reverse side with a layer of natural rubber, styrene-butadiene latexes (SB latexes), or polyurethanes, in known fashion. This layer is designated the "backing layer" or the "backing coating of the carpet". In general it is 2-6 mm thick; because of its elastomeric properties, it contributes substantially to the walking comfort. As a rule, the backing layer of this type is comprised of a foamed material, thus forming a so-called "foam backing". Foam backing not only enhances walking comfort but also provides appreciable thermal and acoustic insulation; further, it tends to have a relatively long service life.

However, this known foam backing is beset by certain drawbacks. The manufacture of the SB latexes causes an appreciable amount of environmental pollution, including air pollution when the latex is applied. Moreover, it has been shown that certain people, particularly children, are allergic to components of the SB latexes. Also, the composition of the latexes renders the product non-recyclable; thus the used carpets must be simply discarded. Finally, there is the nuisance factor that, regardless of whether the latex backing is held by adhesives, residues of the backing tend to be left on the floor when the carpet is removed (e.g. replaced).

A recyclable carpet for automobile floors is known which has a backing comprised of needled felt polypropylene mat instead of polypropylene foam (Zeitschrift Chemiefasern/Textil-Industrie, 1991,

October, 1235). One skilled in the art understands the word "felt" to mean

-- Col. 2 --

a product wherein somewhat randomly arrayed chemical fibers are compressed and subjected to fulling operations whereby the fibers bind together to form the felt (Buurman, [(in German)] "Dictionary of textile room appurtenances", publisher Deutscher Fachverlag). Consolidation may occur by means such as pressing, pounding, and horizontal compression. Thus the raw felt is characterized by high density, and high weight per unit area. Additional consolidation means are not needed.

The upper layer of such carpets is, e.g., a tufted carpet. A third layer, comprised of a modified polypropylene, is disposed between the tufted layer and the needled felt backing. The polypropylene and felt mat is fixed under the carpet [, i.e. under the tufted surface carpet layer,] using a needle felting machine.

US Patent 3834978 discloses a synthetic carpet backing which can be used in with tufted or needled carpets. The backing is comprised of two layers of nonwoven fabric, [each of which is] formed from a Nylon (polyamide) staple fiber mixture. The layers are needled and are joined to the carpet [layer] by thermal bonding (see Claim 1 [of said Patent]).

A preferred embodiment (Col. 2 lines 59 ff. [of US 3834978]) consists of a carpet backing having a substrate comprised of a nonwoven sheet or mat in which irregularly (generally randomly) air-deposited cut fibers, or carded, garnetted (loosely interwoven), or superposed sheets are employed. The thus formed substrate is then needled to form a scrim. This [scrim formation] may be done on one side of a substrate or between substrates. Needling is used to interconnect [all of] the layers. There is no disclosure of setting [of intermediate layers] in a textile binding.

Accordingly, the problem is presented of how to provide a textile binding material for a carpet of the type described initially supra, said carpet having the following characteristics:
-- a backing layer is present which is recyclable along with the textile binding material;
-- the product is free of recognized allergens;
-- the walking comfort is the same as with a foam backing; and
-- the product has high wear-resistance.

This problem is solved by a stressable textile carpet material of the type described initially supra, characterized in that the backing layer is a composite [(e.g. multilayer composite)] which is comprised primarily of a nonwoven fabric which is set in a woven or knitted structure comprised of strips or filaments or fiber yarns; and in that the base fabric and the backing layer are combined (e.g. interconnected) by means of a technique which does not adversely

affect the suitability of the carpet material for recycling.

The first underlying inventive concept consists of replacing the latex backing by a novel second backing which is intended to be connected to the surface carpet and which has the same useful features, such as walking comfort, as known latex foam backings. A second concept is that the materials, using the discretion possessed by an ordinary person skilled in the art, are matched to each other such that after use they [(e.g. the entire carpet)] can be comminuted and converted to another form, e.g. by melting and

-- Col. 3 --

re-extrusion, allowing re-use of the raw materials. There is also the possibility of de-polymerizing the polymeric plastic employed, down to the monomers, followed by re-polymerization.

The described backing is comprised of a nonwoven fabric layer which is set (bound or stitched etc.) in a woven or knitted structure which strengthens the nonwoven fabric in the longitudinal and transverse directions. Where needed, the backing may be provided with conductive means to alleviate electrostatic problems, and advantageously may undergo textile forming in [(i.e. with the use of)] haptics and optics. The composite material can be used as a backing layer for textile carpets, as a substitute for previously commonly used foam backings or compact foam backings, without detriment to the use characteristics, particularly the walking comfort. The setting of this backing layer in a textile binding also reduces wear and facilitates further operations such as binding to the base fabric [(viz. to the surface carpet)].

Techniques for binding the carpet [(surface carpet)] to the backing layer which techniques do not adversely affect recyclability include, e.g., adhesion using polymeric pastes comprised of the same types of polymers as the rest of the carpet, quilting, sewing, and similar known techniques.

In order to provide sufficient walking comfort under various installation situations, it is proposed that the nonwoven fabric have a weight of 100-400 g/sq m and a thickness of 0.5-4 mm.

In order to provide the nonwoven fabric with antistatic characteristics, it is proposed to mix conductive fibers into it, such that the surface resistance is reduced to at least [sic -- i.e. to less than or equal to] 10E Ohm [sic]. When combined in an overall conductive carpet structure, this nonwoven fabric achieves a grounding floor covering (e.g. for computer rooms).

Basically, a variety of manufacturing means may be employed for the nonwoven fabric. In general, any recyclable type of polymeric fibers and fiber mixtures may be employed. E.g., assuming the customary technique of production of a staple fiber nonwoven fabric,

a commercial grade [nonwoven fabric] product is prepared by the process steps of: dispersion, mixing, fine dispersion, felt formation, and consolidation.

Candidates for use as raw materials [for the surface carpet] include polyolefins (e.g. polypropylene and/or polyethylene), polyamides, and polyesters -- the same materials as used for the nonwoven fabric. Thus the pile, the base fabric, the binding material for the backing, and the adhesive compositions (if any), are [each] comprised of either a single raw material (such as polypropylene, polyamide, or polyester) or a combination of raw materials, which are compatible [(from the recyclability standpoint)] or which can be rendered compatible by addition of additives, wherewith [for recycling after use] they can be comminuted and converted into a recycled extruded material.

For the described textile intermediate layer material,

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one may employ a nonwoven fabric which has already been consolidated or an un-consolidated nonwoven fabric. An un-consolidated nonwoven fabric may be consolidated by means of a stitch-bonding process, e.g. the so-called Maliwatt method. It is also possible to use a previously consolidated nonwoven fabric, which has been consolidated by, e.g., mechanical, chemical, or thermal process steps. Known methods of mechanical consolidation include needled felt techniques, fiber interlinking (e.g. the Maliwatt method), or consolidation employing jets of air or water. Known methods of chemical consolidation include the use of liquid binders, foam binders, paste binders, powder binders, [and/]or solvent binders. Known methods of thermal consolidation (where the material is a thermoplastic) include hot air [blowing], contact heating with pressure, infrared heating, and high frequency field [heating] [(e.g. microwave)].

Nonwoven fabrics which may be used include staple fiber felts, and so-called filament felts, which latter may be laid filament felts (employing an endless filament) (so-called spun-bonded filament felts) or may be melt-blown filament felts. Filament felts may also be consolidated by the above-described consolidation methods.

A particularly inexpensive means of integrating nonwoven fabric materials is use of a woven formation comprising strip materials. Strip materials are known in textile technology and are used for many applications; they are usually produced by flat film (or sheet) extrusion, wherewith the extruded film or sheet is cut into strips of the desired width.

The nonwoven fabric can also be integrated into a woven or knitted fabric comprised of filament yarn or fiber yarn. A "filament yarn" is understood to be a yarn comprised of a plurality of endless fibers, with or without twisting; wherewith the endless

fibers may have a texturized form. The texturizing process confers a textile fiber appearance on the otherwise smooth [synthetic] filament yarn, by means of undulation or the like. The raw materials for the integrating fabric [(setting fabric)] may be a polyolefin, polyamide, or polyester.

The term "fiber yarn" (particularly staple fiber yarn) is understood to mean yarns produced from fibers of appropriate lengths, by means of a ring spinning or rotor spinning method. Suitable materials include polyolefins (e.g. polypropylene or polyethylene), polyamides, and polyesters.

The backing layer employed to set the nonwoven fabric in a textile binding may be manufactured by any of a number of methods. Examples which might be mentioned are warp-knitting, the so-called Maliwatt method with incorporation of weft [threads], and the needled felt technique.

The first two methods mentioned above [(warp-knitting and the Maliwatt method)] employ a system of longitudinal fibers which provides stability to the flat backing layer structure. The

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longitudinal fiber system is comprised of the above-described strip material, filament yarns, or fiber yarns, and is incorporated using a customary stitching construction. Optionally, with both methods, a transverse fiber system may also be employed, which contributes stability in the transverse direction, against potential stressing of the finished carpet. The transverse fiber system may also be employed as a base to form a textile fabric, e.g. a design [(imposed over the primary pile?)]. Further, the transverse fiber system may serve to improve the binding [of the backing structure] to the surface carpet, when the transverse fibers are applied against the rear side of the surface carpet along with the nonwoven fabric.

Exemplary embodiments of the invention are illustrated in the drawings. The first and second Figures schematically illustrate two different inventive embodiments, each of which comprises three layers of a combined textile material, here a carpet material.

KEY to drawings:

1	base fabric.
2	pile.
3	adhesive mass.
4	velour.
5	loops
6	nonwoven fabric.
7	[backing layer] fabric.
7'	[backing layer] fabric (e.g. warp-knitted or sewn-knitted).
9	mesh comprised of strips or yarn.
10	conductive fibers.
11	conductive yarn [sic].
12	warp fibers.

Shown schematically [in each instance] are a base fabric 1 which receives the pile (2, 2) during the tufting process. The pile 2 may be present as closed loops 5 or as trimmed nap (velour) 4.

In the first variant, instead of the customary backing layer comprised of SB latex (styrene-butadiene), one has [the backing layer comprised of] a nonwoven fabric [6] which itself has sewn to it a fabric [backing layer] 7, wherewith the nonwoven fabric is fixed to the basic carpet material [1] by means of an adhesive mass 3 (e.g. a polymeric adhesive mass comprised of one or more polymers). It is intended that the sewn-on [bottom backing layer] fabric [7] will provide the nonwoven fabric 6 with the necessary longitudinal and transverse strength, and will confer [upon the back of the composite material] the appearance of a [customary] fabric.

By mixing-in of conductive fibers 10 into the composition of the nonwoven fabric, the surface resistance was reduced to # 10E Ohm [sic]. The combination of a conductive second backing and a correspondingly equipped carpet structure provides a carpet material which is ground-conductive.

Another means of manufacturing a product having a second backing is to stitch-in a non-consolidated or pre-consolidated nonwoven fabric 6 (Fig. 2). The intermeshing to form a mesh-like structure can be accomplished according to the Malimo principle or the warp-knitting principle. This process confers stability [i.e. strength] in the longitudinal direction; to additionally confer transverse strength, and as a decorative component, a weft thread [i.e. weft threads] 12 can be laid in [sic]. By additionally knitting-in conductive yarns or strips 11, a composite textile material can be produced which has a surface resistance reduced to # 10E Ohm [sic]. With this means of providing a second backing, in combination with a corresponding [basic] carpet structure, one obtains a carpet material which is ground-conductive.

Finally, it might be mentioned that the materials should be

readily recyclable and mutually "compatible" from the standpoint of amenability [of the overall product] to recycling. This means that they should be comprised of the same underlying materials (e.g. polypropylene, polyamide, or polyethylene) or should be conditioned by so-called "compatibilizers",

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such that they are rendered miscible. It is also possible, by mixing (blending), to produce a certain amount of a derivative base material which is combined with a correspondingly smaller amount of recycling material, in order to improve the strength properties [of the recycled product].

In addition to the exemplary embodiments [set forth supra], other textile binding means are possible, as described [generally] in the introduction section of the Specification.

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Patent claims:

1. A stressable textile carpet material (floor covering), comprised of:
-- a base fabric (1) and a pile (2) which pile is bound to the base fabric (1) and which covers the base fabric on the treading surface, wherewith they [(the base fabric and pile)] are comprised of polymeric fibers and are [together] manufactured in a tufting process; and
-- a backing layer (6, 7) which is bound to the side of the base fabric which side is opposite to the pile (viz. is bound to the rear side of the base fabric) and which provides walking comfort (and determines the walking comfort);
characterized in that
the backing layer is a composite [(e.g. multilayer structure)] which is comprised primarily of a nonwoven fabric (6) which is set in a woven or knitted structure comprised of strips or filaments or fiber yarns; and in that the base fabric and the backing layer are combined (e.g. interconnected) by means of a technique which does not adversely affect the suitability of the carpet material for recycling.

2. A textile carpet material according to claim 1; characterized in that in the un-set state the nonwoven fabric (6) has a weight of 100-400 g/sq m and a thickness of 0.5-10 mm.

3. A textile carpet material according to claim 1 or 2; characterized in that the nonwoven fabric is set or held longitudinally and transversely by means of a mesh structure or a fabric.

4. A textile carpet material according to one of claims 1 to 3; characterized in that the nonwoven fabric is stitched to, or otherwise interlinked with, warp fibers (longitudinal fibers) (12).

5. A textile carpet material according to claim 3; characterized in that the setting (or holding) fabric is a leno fabric.

6. A textile carpet material according to claim 3; characterized in that the mesh structure is comprised of a warp-knitted or sewn-knitted material (7').

7. A textile carpet material according to claim 3; characterized in that the nonwoven fabric (6) is interlinked with the aid of warp-knitting and/or Maliwatt methods.

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8. A textile carpet material according to claim 1; characterized in that the strips for the woven or knitted structure are comprised of polymeric material selected from the group of polypropylene, polyethylene, polyamide, or polyester.

9. A textile carpet material according to one of the preceding claims; characterized in that the nonwoven fabric [(6)] is consolidated chemically prior to the setting [(viz. setting in the woven or knitted structure)].

10. A textile carpet material according to one of the preceding claims; characterized in that the nonwoven fabric [(6)] is consolidated thermally prior to the setting.

11. A textile carpet material according to one of the preceding claims; characterized in that the nonwoven fabric [(6)] is consolidated mechanically, e.g. by needle felting or by a Malimo nonwoven fabric technique.

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Abstract [(from the Patent Application EP 0547533 A1)]:

The invention relates to a stressable textile carpet material (floor covering) which is produced from polymeric fibers in a tufting process, and is comprised of:
-- a base fabric (1) and a pile (2) which pile is bound to the base fabric (1) and which covers the base fabric on the treading surface; and
-- a backing layer (6, 7).

The backing layer is a composite [(e.g. a multilayer structure)] which is comprised primarily of a nonwoven fabric [(6)] which is set by means of a textile binding. A technique which does not adversely affect the recyclability of the carpet material is employed to bind the base fabric and the backing layer together.

[(Figure, showing 2 different exemplary embodiments.)]

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